ENCLOSURE 3

APPENDIX B to Consent Decree

**STATEMENT OF WORK FOR
THE REMEDIAL DESIGN AND REMEDIAL ACTION
AT
ASHLAND NORTHERN STATES POWER LAKEFRONT SITE
Ashland
Ashland County, Wisconsin**

I. PURPOSE

The purpose of this Statement of Work (SOW) is to set forth requirements for implementation of the remedial action set forth in the Record of Decision (ROD), which was signed by the Director of the Superfund Division of the U.S. Environmental Protection Agency (EPA), Region 5, on September 30, 2010, for the Ashland Northern States Power Lakefront Site (Site). The Settling Defendants shall follow the Consent Decree, the ROD, the SOW, the approved Remedial Design Work Plan, the approved Remedial Action Work Plan, EPA Superfund Remedial Design and Remedial Action Guidance and any additional guidance provided by EPA in submitting deliverables for designing and implementing the remedial action at the Site.

II. PERFORMANCE STANDARDS FOR THE REMEDIAL ACTION

Settling Defendants shall design, implement and maintain the remedy selected in the ROD to meet the performance standards and specifications set forth in the ROD and this SOW. Performance standards shall include cleanup standards, standards of control, quality criteria and other substantive requirements, criteria, limitations and Applicable or Relevant and Appropriate Requirements (ARARs) set forth in the ROD, in the Tables and Appendices of the ROD, this SOW and Consent Decree.

1. Site Security

During remedy implementation, the Settling Defendants shall maintain site securiy around the Site to prevent access and vandalism to the Site. When necessary, warning signs shall be posted to advise that the area is hazardous due to chemicals in the soils, sediments and groundwater which pose a risk to public health through direct contact. The signs shall also provide a telephone number to call for further information.

2. Construction, Installation, and Operation of the Selected Remedy

The selected remedy is Scenario 10, which includes the following components:

- **Sediments:** Alternative SED-6 – Using excavation equipment, remove in the dry all nearshore sediment and wood debris. In addition, remove wood debris from offshore sediments and mechanically or hydraulically dredge remaining offshore sediments. After dredging/excavation is completed, place six inches of clean fill on dredged areas for lakebed stabilization. Dewater and stabilize sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport stabilized sediments off site to NR 500 licensed landfill or thermal treatment. Dispose of or burn wood debris separately.

- **Kreher Park:** Limited soil/source removal with ex-situ thermal treatment (Alternative S-5A) and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps at Kreher Park to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. The remedy will serve to restore the shallow groundwater to its beneficial use by reducing contaminant levels in groundwater. In-situ chemical oxidation (GW-6) can be used to possibly enhance groundwater treatment.
- **Upper Bluff/Filled Ravine:** Limited soil removal with ex-situ thermal treatment (Alternative S-5A) and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. The remedy will serve to restore the shallow groundwater to its beneficial use by reducing contaminant levels in groundwater. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Copper Falls Aquifer:** Enhance existing groundwater extraction system (GW-9B). In-situ chemical oxidation (GW-6) or in-situ treatment via ozone sparge (GW-3) can be used to possibly enhance groundwater treatment. Enhancing the existing groundwater extraction and treatment system (and possibly using in-situ treatment) will hydraulically control the groundwater contamination and NAPL in the aquifer. The remedy will also serve to make progress toward restoring groundwater to beneficial use.
- **Conduct O&M and Long-Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement land use controls as part of remedial response at Upper Bluff and Kreher Park where contaminants remain in subsurface and for shallow groundwater in contained areas.

Each of these components of the selected remedy is described in greater detail below.

Sediments: Alternative SED-6 – (Dry Excavation near shore/Dredging offshore) - Using excavation equipment, remove in the dry all near shore sediment and wood debris that exceeds the RAL of 2,295 ug tPAH/g OC (9.5 ppm tPAH dwt at 0.415% OC). In addition, remove wood debris from sediments outside the dry excavation area and mechanically or hydraulically dredge all targeted sediments that exceed the RAL. After dredging is completed, place six inches of clean fill/sand on dredged areas for stabilization. Dewater and stabilize sediments at Kreher Park area and treat wastewater to meet state and federal discharge limits; discharge treated wastewater to the lake or POTW. Thermally treat sediments or stabilize sediments to transport off site for disposal to a NR 500 licensed landfill. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediment at a NR 500 licensed landfill will be the alternate remedy. Thermal treatment will be determined during the pre-design phase. Dispose of or burn wood debris separately. If a pre-design pilot test for wet dredging of the near shore area is conducted and indicates that dredging rather than dry excavation within the near shore area will attain the established performance standards and can be conducted in a manner protective of human health and the environment, then EPA, in consultation with WDNR, will recommend that an alternate sediment remedy (dredging) be implemented for both near shore and outer shore sediments and EPA will publish its decision in an ESD.

This alternative consists of the following components, the specifications of which may vary and will be finalized during the Remedial Design:

1) Determine sediment with concentrations of PAH greater than 9.5 ppm tPAH/g dwt at 0.415% OC.
2) Delineation of near shore areas that contain NAPL-impacted sediments and substantial wood debris will be done during pre-design testing and may be refined during Remedial Action. This will become the boundary of the near shore dry excavation area and the offshore dredging area. For purposes of this conceptual plan the boundary is assumed to be approximately 200 feet from the shoreline. Sheet piling would be constructed along the boundary between the near shore dry excavation area and the offshore dredging area.
3) In order to control wave action on the near shore area containment wall (sheet pile), a wave attenuation flotation device or breakwater wall will be installed at the outer boundary of the area to be remediated (north of 2900N).
4) Lake water within the sheet pile containment would be removed with two 500 gpm, stand-alone pumps. Lake water pumped from within the containment will be managed/treated by an adsorbent liquid phase activated carbon system sized to adequately remove contaminants of concern. The untreated lake water will be tested to provide contaminant mass loading data and the carbon will be changed out and regenerated based upon the contaminant load and testing for contaminants. The treated effluent will be discharged directly to Lake Superior following laboratory testing that shows compliance with WDNR water quality criteria and meet the substantive requirements for NPDES permit.
5) Variable rate discharge pumps will be used to assist with dewatering sediments. Wastewater obtained from sediment dewatering will be managed/treated with filtration of the solids followed by contaminant adsorption with liquid phase activated carbon filters. The wastewater will flow through bag or sand filters and will then flow into a liquid phase activated carbon system sized to remove contaminants of concern from the water.

The wastewater will be tested to estimate the contaminant mass loading on the carbon, and the carbon will be changed out and regenerated on an as needed basis based on testing for contaminants. In addition, the effluent will be tested to show compliance with WDNR water quality criteria, and discharged to the lake. Alternatively, if surface water criteria are not initially met, the water will be contained and re-treated, and the system will be adjusted to treat the water fully.

6) Wood debris and sediment will be prepared for loading and disposal by one of the following methods: Stabilizing wet, fine grained (silt and clay) sediments with reagents such as Type C fly ash and/or Portland cement and excavation of wood debris and granular (sand and gravel) sediments on an impermeable asphalt pad to allow drainage of fluids by gravity flow.
7) Sediment excavation/stabilization/dewatering will be performed with heavy equipment such as a crane with drag-line and/or tracked excavator and/or wheeled conveyor and displacement with a bull dozer. It is anticipated that all of the sediment volume will be thermally treated or disposed off site.
8) Imported clean sand will be used as backfill in the area where removal of sediment and wood debris is performed in the dry. Heavy equipment will be used to place the sand. Techniques for placement of the sand may include: pushing the sand into the excavation created by removal of the sediment and wood debris and/or placing sand from long-stick excavators positioned adjacent to the sheet piling or the shoreline. Temporary sand berms may be constructed to support equipment used for excavation. Material from these berms may later be used for backfill.
9) Sediment outside the near shore containment will be removed using barge-based hydraulic or mechanical dredging. Dredge material will be conveyed to shore-based dewatering facility.
10) Excavated and dredged sediment will be dewatered on site using a settling pond and mechanical separation followed by on-site treatment of sediment and liquid and/or off-site disposal of untreated sediment;
11) If sediment is treated using thermal desorption or incineration it would be sent for off-site disposal at a solid waste or other landfill after treatment;
12) If sediment is not treated on site but only stabilized, it would be sent to a NR 500 permitted landfill for off-site disposal;
13) Wastewater will be treated using flocculation, clarification, sand filtering, and carbon filtering and discharged to the Ashland WWTP. Alternatively it could be discharged directly to Lake Superior if it meets DNR surface water criteria and the substantive requirements of an NPDES permit;
14) Groundwater removed from a trench system that parallels the sheet pile wall on the land side will be treated with filtration, oil/water separation followed by treatment with liquid phase activated carbon. As with the other water that will enter the activated carbon system, water will be treated to comply with WDNR water quality criteria and discharged into the lake.
15) Sediment areas outside of the dredge area where concentrations of PAH are greater than 5.6 µg tPAH/g dwt at 0.415% OC will be monitored.

Equipment that may be used for implementation of this alternative includes:

- Construction of wave attenuation floatation device on lakeside of containment wall
    - Barge equipped with crane, pile driving hammer and steel sheet piles with interlock seal
    - Barge equipped with crane and carriage lift for placement of stone and barges loaded with blasted rock/cut limestone, or barges equipped with crane for placement of wave attenuation device and dead-man
    - Hydrocarbon collection booms
- Construction of landside containment wall
    - Crane, pile driving hammer and sheet piles with interlock seal
    - Hydrocarbon collection booms
- Dewatering equipment – for removing water from bay, groundwater collection trench and sediment
    - Trailer mounted 500 gpm pumps
    - Variable rate (10-100 gpm) sump pumps
    - Sump pump for collection of drained sediment fluids from asphalt drainage pad
    - Mechanical dewatering equipment
- Water treatment equipment
    - Piping to lake or WWTP for treatment of water and collected fluids
    - Water treatment system
        - Oil/water separator
        - Bag filtration
        - Activated carbon adsorption
        - Sand Filtration
- Sediment excavation equipment
    - Modular barges to provide access throughout containment areas, if necessary
    - Geotechnical mats (e.g., Durabase) may be needed on crest of sand berms to provide support to heavy equipment
    - Bulldozers
    - Excavators
    - Crane equipped with drag–line to move sediment into position for handling and stabilization
    - Wheel mounted conveyors
- Sediment dredging equipment
    - Hydraulic
    - Mechanical
- Sediment stabilization/drainage equipment
    - Backhoes
    - Compressors
    - Tanker trucks containing reagent
    - Asphalt drainage pad and sump

- Disposal equipment
    - Transport to disposal location
        - Truck
- Monitoring equipment – to evaluate effectiveness of remedy
    - Groundwater monitoring wells
    - Piezometers for water level measurements
    - Sediment sampling equipment
    - Surface water sampling equipment

Concept

Under this alternative, sediments greater than 9.5 ppm tPAH/g dwt at 0.415% OC would be removed regardless of depth. In some areas, sediments as deep as ten feet would be removed. Sediment removal under this alternative would be conducted with excavators, mechanical dredges and hydraulic dredges. In some near shore areas, caissons could be constructed to enable dewatering near shore areas, which would allow use of shore-based excavators to remove sediment. The efficacy of this latter approach could be determined during a pilot scale project.

Engineering controls would need to be implemented to minimize volatilization of VOCs during dredging. This can best be evaluated during a pilot scale project. During dredging operations, turbidity curtains and floating hydrocarbon booms or sheet piling, if necessary based on the results of a potential pilot study that would be conducted during pre-design phase, would be deployed to minimize dispersal of suspended sediments or floating free phase. Site restoration would include placing at a minimum six inches of clean fill/sand on all areas that have been dredged.

Removal is technically feasible for the Site, although several issues would have to be addressed in the design of a dredging alternative, including control of the release of free-phase product and dispersal and volatilization of VOCs during dredging activities, as well as management of dredging residuals and handling of a substantial amount of wood debris. Some aspects of the Site are more disposed to the use of mechanical dredges or excavators (e.g., debris removal), while other aspects favor hydraulic dredges, (e.g., capture of free phase and minimization of volatilization).

Implementation of Remedy

Mobilization/Demobilization

This includes mobilization and demobilization of all the equipment and facilities needed to implement this alternative.

Construction of Temporary Wave Attenuation Device

Wave dampening will be required to minimize dynamic forces on the containment wall that will enclose the near shore area. A partially assembled wave attenuator will be shipped to the Site on flat bed trailers. The device will be unloaded and placed onto a work barge for assembly along the proposed alignment. Installation along the alignment will occur by placing concrete dead-men along the alignment. The exposed rebar extending from the dead-men would be connected to metal shackles that are connected to a metal cable which connects to the metal rods on the wave attenuator. Adjustment of the cables length would be performed to maximize wave attenuation.

During winter the wave attenuator could remain in-place or be pulled below the surface of the water to a depth that would be below the bottom of the ice that customarily forms in the bay. After ice out in the spring, the attenuator could be returned to its initial position by adjusting the cable attached to the dead-men. At the completion of the project the attenuator could be anchored to the bottom or cleaned and sold.

A breakwater wall could also be utilized to minimize the wave action on the near shore area containment wall. In addition, if a breakwater wall is constructed, it could also be utilized as a semi-permanent confinement system during the dredging of offshore sediments (as described in the "*Dredging of Offshore Sediments*" section below).

Containment Wall Installation

Landside containment wall construction will be performed by driving steel sheet piling that utilizes an interlock sealant to minimize seepage. The lake and landside sheet piling will be driven into the underlying Miller Creek formation approximately 20 feet and 5 feet, respectively. Prior to driving the sheet piling, an exploratory trench will be excavated along the land wall alignment to a depth of approximately 10 feet below ground surface to remove obstacles or debris that would prevent the sheeting from being installed.

The lakeside containment wall will be constructed from a barge by driving PZ-35 steel sheeting. Preliminary structural analysis of the PZ-35 wall system without the use of a breakwater wall indicates excessive deflections (around 12 to 14 inches of deflection at the top of the wall) when lateral forces from the lake waves are applied to the sheeting. Use of a wave attenuator or breakwater wall decreases the wall deflection to a more desired defection of approximately 6 inches or less. Decreasing wall deflection will also help reduce the volume of seepage through the wall located in the bay. The final design of the lakeside containment wall will be determined at the Remedial Design stage after geotechnical data is collected along the alignment.

Following completion of the containment wall system, the water within the containment will be removed using trailer mounted 500 gpm pumps. The discharged water from initial pumping within the containment wall will be transported via pipeline to the WWTP and processed with minimal treatment. Variable rate discharge pumps will be deployed to reduce the water content of the sediments within the containment. This water will also be piped to the WWTP and treated before discharge. Details of treatment will be developed during Remedial Design.

Excavation/stabilization/disposal of near shore sediments

The excavation of the wood debris in the near shore area will be performed with tracked mounted excavators and a crane equipped with a dragline and bucket. The excavated wood debris and some of the sediments that underlie the debris will be placed on the impermeable asphalt drying pad to allowing additional drainage of trapped fluids. The drained wood debris will be loaded into trucks for transport to the disposal facility or off-site facility for burning. Fluids collected at the drainage pad will be transferred to the WWTP and treated before being discharged.

The silty/clayey sediments underlying the wood deposits will be stabilized with reagents prior to being loaded onto trucks for disposal. The reagent(s) will be of a type that will help to absorb the majority of the remaining fluids within the silty/clayey sediments. Concrete Jersey barriers will be used to separate the stabilization activity from other activities. Stabilization of the sediments will be performed by using a compressor to transfer the reagent provided in tanker trucks to the stabilization area. Mixing of the reagent with the sediments will be performed using an excavator bucket and/or bulldozers. The stabilized sediments will be loaded by excavator into trucks for transport to the disposal facility.

The underlying sandy granular sediments will be removed and placed on an asphalt drainage pad to allow additional drainage of fluids. The sandy material will be moved to the drainage pad using wheel mounted conveyors and/or tracked excavators and bull dozers. Drained sandy sediments will be loaded onto trucks for transport in closed watertight containers to a disposal facility. Fluids collected at the drainage pad will be transferred to the WWTP and treated before being discharged.

As with other sediment alternatives, controls for minimization of volatile releases are available for onshore operations; however, volatilization control for near shore dry excavation would have to be investigated further during the pre-design phase .

Dredging of Offshore Sediments

Sediments outside of near shore excavation area will be dredged using conventional dredging technology. Dredging operations further from shore will require a semi-permanent confinement system in the bay (e.g., sheet pile wall, breakwater wall) at the outer edge (north) of the Site work area to minimize dispersal of suspended sediments or floating free phase. The details of the system and exact requirements will be fully delineated during the pre-design phase and Remedial Design for the sediment remedy. Sediments in this area are less contaminated and have less debris than the near shore excavation area, therefore, it is anticipated that there will be less potential for dispersal of contaminated sediment. However, during dredging operations, turbidity curtains and floating hydrocarbon booms would be deployed to minimize dispersal of resuspended sediments or free-phase product.

During Remedial Design dredging performance objectives will be developed for allowable rates of sediment resuspension during dredging based upon water quality standards that are protective of ecological receptors. These will be used for operational control of dredging. Typically, performance objectives for resuspension are two or three-tiered and specify how dredging operations need to be modified if the action levels are exceeded.

Sections 12.3 and 12.4 of the ROD discuss dredging performance standards and the remedial approach for sediments, respectively, including specifying under what conditions re-dredging would be necessary.

Dredge material will be conveyed hydraulically or by barge to dewatering areas onshore.

After dredging is completed, six inches of clean fill/sand would be placed on areas that are dredged for purposes of providing lakebed stabilization. A side benefit is that it will also provide a better habitat for recruitment of benthic macroinvertebrates and for spawning of fish. The issue of dredged residuals management is discussed in Section 12.4 of the ROD.

Volatilization and Odor Control

There is a potential for volatilization during dry excavation of near shore sediments since areas would be exposed to the air. Although a dry excavation scenario was not explicitly modeled in the Air Emissions Treatability Study, volatiles could disperse beyond the immediate vicinity of excavation and onshore treatment operations, depending upon ambient weather conditions. With the proximity of a relatively large population in Ashland, this presents the possibility of unacceptable exposure unless volatiles can be controlled.

Engineering controls would need to be implemented to minimize volatilization of VOCs during dredging. The need for and design of engineering controls for volatilization would need to be evaluated during a pilot scale project.

Controls for minimization of volatile releases are available for dry excavation and onshore operations; however, volatilization control for operations on the water would likely have to be investigated further during a pilot scale project during pre-design, since tenting over working dredges on the water is difficult and would add complexity to maintaining efficient dredge production rates. Beyond controls that can be employed by the dredge operator to minimize exposure of sediment to air there is little precedent for implementing engineering controls for volatilization at the dredge platform. Dredging areas with a high potential for release of volatiles during cooler periods of the year or when winds are predominantly offshore also may help minimize transport of volatiles to residential areas. However, it is likely that dredging will be shut down in the colder months of the year and wind directions in the Ashland area are variable and sometimes unpredictable.

Sediment Dewatering

Dewatering of the sediment will be performed using variable rate discharge pumps that are placed in sumps pits located within the containment area and adjacent to the outermost containment wall. Additional drainage of wood debris and sandy granular sediments will be provided by placing these materials on the asphalt drainage pad built at the Kreher Park area. Sediment dewatering and seepage through the containment wall are estimated at 7,000 gal/day.

Wastewater Treatment

Water treatment includes bag/sand filtration, oil/water separation, adsorption with activated carbon filter and related testing for O&M and discharge. Most of the systems are closed and should have minimal impact on air emissions. Discharge will be to the City of Ashland WWTP or to Lake Superior if it meets WDNR water quality criteria. Estimated total treatment quantity for the dredge in the dry option is 60,000,000 gallons. The total treatment volume is based on a project duration of 2 years.

Sediment Treatment

Sediment treatment includes either stabilization for disposal in a NR 500 permitted landfill or alternatively, thermal treatment before land filling in a solid waste landfill. Both processes have the potential to create some emissions in handling the dewatered sediment feed to the stabilization or thermal treatment systems. However, there is likely much lower emissions associated with sediment treatment than with the dewatering operations unless there is an upset in the operations. HTTD is again assumed to be the most cost effective thermal method and is the basis for cost estimates for thermal treatment at this time. However additional design testing would be needed to evaluate this choice.

Sediment Disposal

The disposal process will include the loading of sediment following drying and treatment/stabilization at the Site, and transportation to a commercial/industrial landfill or NR 500 permitted landfill. Several scenarios were evaluated for this option, assuming a sediment quantity of 133,000 cy based upon the sediment PRG. For purposes of cost estimation it is assumed one cubic yard of sediment will weigh 1.5 tons.

Other Disposal Alternatives

NSPW also may initiate siting of landfill per chapter NR 500 requirements in the Ashland area for solid materials removed from the Lakefront Site. This disposal option is dependent on the material volume.

Ancillary Solid Wastes

Waste such as PPE, construction debris and other types of solid wastes generated during the conduct of remedial activities can be disposed of at a local municipal landfill. The quantity generated will depend on the remedial alternative. PPE will be evaluated and handled in accordance with EPA guidance document to handle investigation derived waste (EPA 2007).

Wood Waste

Under this alternative there is the potential for generating a substantial quantity of wood waste. The wood waste ranges in size from sawdust and chips to timber. Potentially, the larger debris could be burned as fuel at the NSP Bayfront Power Plant located in Ashland. Some additional maintenance at the plant would be required to accommodate the wood debris but this is considered a viable option at this time and will evaluated further during remedial design.

Kreher Park and Upper Bluff/Filled Ravine: For soils, Alternative S-5A – Limited soil/ source removal with ex-situ thermal treatment. Excavated soil would likely be treated on site by a mobile unit. Debris must be separated by size from material suitable for thermal treatment and transported off site for disposal. Consequently, wood waste at Kreher Park and fly-ash and cinders in the Filled Ravine at the Upper Bluff area must be separated from NAPL-contaminated material encountered in these areas. Thermal treatment by LTTD or HTTD will be completed for suitable NAPL-contaminated fill material, and contaminated material not suitable for thermal treatment will be transported off-site for disposal. Fill material including fly ash and cinders that is not contaminated with VOC and PAH compounds will be returned to the excavation.

Thermal treatment will be performed on suitable fill material from areas with the highest levels of contamination. This includes the former gas holder area at the Upper Bluff, the NAPL in the Filled Ravine and contaminated soil encountered above the wood waste layer at Kreher Park; the underlying wood waste layer would not be suitable for thermal treatment. Key elements of the conceptual design for ex-situ thermal treatment of material removed from these areas follows:

1. A mobile unit and ancillary equipment will be set up at Kreher Park because inadequate space is available at the Upper Bluff area.
2. Demolition of the center section of the NSPW service center for excavation south of St. Claire Street will be required to access contaminated soil beneath this building at the Upper Bluff area.
3. Removal of existing asphalt pavement in the alley and courtyard area will also be required.
4. All shallow water table wells screened in the fill soil unit will be abandoned prior to excavation. Piezometers screened in the underlying Copper Falls aquifer will be protected during excavation and backfilling activities and remain in place for future use.
5. Removal will include the excavation of soil containing NAPL, and the removal of buried structures (i.e. former gas holders) at the Upper Bluff area south of St. Claire Street. This area includes the excavation of unsaturated and saturated zone soils to a depth between 12 and 15 feet for an area approximately 130 feet by 130 feet, yielding between 7,600 and 9,400 cubic yards. Also included for removal will be soil containing NAPL in the

Filled Ravine on the north side of St. Claire Street. This will include the excavation of saturated zone soil from the bottom five feet of the Filled Ravine where the clay tile and NAPL were encountered. At the surface, this excavation area will be approximately 30 by 75 feet wide. An estimated 75 to 150 cubic yards of NAPL-contaminated soil will be removed from the base of the Filled Ravine.

6. Removal will also include the excavation of unsaturated and saturated zone soils at the former coal tar dump area. This includes approximately 5 feet of contaminated soil in an area approximately 260 feet by 100 feet, yielding approximately 4,800 cubic yards.
7. Deep excavations or excavations completed near facility buildings may require shoring to support sidewalls.
8. Groundwater seeping into the excavation will be collected, temporarily placed in holding tanks, and treated by the on-site treatment system prior to discharge to the sanitary or storm sewer. Discharge to the sanitary sewer system will require approval from the wastewater treatment plant, and discharge to a storm sewer will require a WPDES permit.
9. Saturated and unsaturated zone material will be thermally treated to reduce contaminant mass and toxicity and returned to the excavation as backfill. Material unsuitable for thermal treatment will be transported off site for landfill disposal. Fill material not contaminated with VOC and PAH compounds will be returned to the excavation as backfill.
10. Site restoration at the Upper Bluff area will include the installation of new asphalt pavement as a surface barrier over the excavated area on both sides of St. Claire Street, and new asphalt pavement at the gravel covered courtyard area on the north side of the street. The existing street (inspected for water tightness and sealed or replaced as needed) and new asphalt pavement on the NSPW property will prevent exposure to fill material beneath St. Claire Street and the NSPW storage yard.
11. Site restoration at Kreher Park will include backfilling excavated areas with clean fill material and installation of a new RCRA Subtitle D (ch. NR 500) cap over the excavated area.

Long-term operation and maintenance of backfilled areas will include groundwater monitoring, cap maintenance including the periodic inspection and repair of all asphalt and soil caps.

For groundwater, Alternative GW-2A - Containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control. Containment for groundwater contamination consists of engineered surface barriers, vertical barrier walls installed in the aquifer, and extraction wells (hydraulic barrier wells). Surface barriers eliminate the direct contact exposure pathway. They also can reduce contaminant leaching from the unsaturated zone, by restricting infiltrating water from contacting contaminated soil at areas where contaminated soil is present. Vertical barrier walls and barrier wells prevent the off-site migration of contaminants with groundwater. Institutional controls will be implemented as part of this remedial response to prevent exposure to groundwater contamination remaining within the contained area until such time as groundwater cleanup standards are achieved. Long-term operation and maintenance will include groundwater monitoring to confirm contaminants are not migrating from the contained area. This will include fluid level monitoring and groundwater extraction to ensure the hydraulic head within the confined area remains at or below lake level.

Engineered surface barriers, vertical barrier walls, and barrier wells are described below.

Engineered Surface Barriers

Engineered surface barriers are considered passive containment alternatives because the contaminated zone is not disturbed, and only minimal maintenance is required following implementation. Surface barriers include the following:

- Asphalt cap;
- Low permeability soil cap (i.e. 2 feet of clay with hydraulic conductivity of less than 10^{-7} cm/sec);
- Multi-layer cap with a minimum two-foot thick clay barrier, drainage layer, soil and vegetated top soil cover; and
- Multi-layer cap with geomembrane (a minimum two-foot thick clay barrier, geomembrane, drainage layer, soil and vegetated top soil cover.

At the Upper Bluff area, asphalt caps over the Filled Ravine as surface barriers will be compatible with existing and future site use. At Kreher Park, a low permeability soil cap could be placed over the entire 11.6 acre parcel, but installation of a clay cap over the entire park will require the removal of the existing marina parking lot, Marina Drive, and the former WWTP. New asphalt roads, parking lots, and/or slab on grade buildings could be then constructed on top of a larger cap, or installed at select areas in place of a cap for the entire park. These smaller surface barriers will be designed to be compatible with existing and future site use, and include asphalt pavement for the marina parking lot and a low permeability cap for the former coal tar dump. Asphalt pavement over the gravel covered marina parking lot will reduce infiltration at this area. A surface barrier over the former coal tar dump area will reduce contaminant leaching from the unsaturated zone if contaminated soil remains in place. If the WWTP is removed, a clay cap or asphalt pavement could be installed at this area.

Multi-layer caps will be compatible with on-site areas of unexcavated soil, especially at Kreher Park. Single layer asphalt and low permeability caps will meet 40 CFR Subtitle D requirements, and multi-layer caps will meet 40 CFR Subtitle C requirements.

Groundwater Extraction/Barrier Wells

Barrier wells are considered active hydraulic containment alternatives. Long-term operation (groundwater extraction), maintenance, and monitoring will be required. Down gradient barrier wells will be used for groundwater at the Upper Bluff and for the saturated fill unit at Kreher Park. These wells will prevent contaminants from migrating off site with groundwater.

Vertical Barrier Walls

Vertical barrier walls consist of a slurry wall or sheet piling installed around the perimeter of the contaminated groundwater zone. A slurry wall is a low permeability barrier constructed by placing a low permeability material (slurry) in a trench around the perimeter of the contaminated groundwater mass. Sheet piling will consist of inter-locking sheets of steel pilings that form a continuous wall installed around the perimeter of the contaminated groundwater mass.

For shallow groundwater, both types of vertical barriers could be anchored into the underlying low permeability Miller Creek Formation to create a barrier that will prevent contaminants in the shallow fill units from migrating off site with groundwater. However, because groundwater in the Filled Ravine discharges to Kreher Park, vertical barriers will be used to funnel groundwater from the Filled Ravine to Kreher Park, which will be enclosed by vertical barrier walls. Engineered surface barriers will be used with vertical barriers to minimize groundwater recharge to contained areas from infiltration. Key elements for the conceptual design of a sheet pile vertical barrier wall around the perimeter of Kreher Park follows:

1. Site preparation will include clearing and grubbing of small trees and bushes along the bluff and near the former seep area as needed.
2. Although the former wastewater treatment plant will be located within the contained area, demolition of this dormant facility may be required.
3. A vertical barrier wall will be placed around the perimeter of Kreher Park. This vertical barrier will consist of a sheet pile wall anchored into the underlying Miller Creek Formation.
4. The sheet pile wall along the shoreline will be installed at an approximate depth of 25 feet below existing grade to allow the off-shore removal of sediment to a depth of ten feet adjacent to the sheet pile wall. The sheet pile wall on the south, east, and west sides of Kreher Park will be installed at an approximate depth of 16 feet below existing grade.
5. Surface barriers will be installed over the Filled Ravine to minimize groundwater recharge from infiltration, and the sheet pile wall on the south side of Kreher Park will terminate on the east and west flanks of the Filled Ravine to create a "funnel" for shallow groundwater discharge into Kreher Park.
6. A groundwater diversion trench will be installed between the remainder of the south wall and the Upper Bluff area to divert groundwater that currently seeps from the Upper Bluff area into the Kreher Park fill unit.
7. At Kreher Park, site restoration will include installation of new asphalt pavement over the marina parking lot to minimize infiltration in this area. Additionally, a low permeability soil cap will be placed over the former coal tar dump area, and if applicable, a soil cap over the disposal cell.
8. Regrading and a storm water basin will be constructed within the confined area to manage storm water and restrict infiltration. The storm water basin will be lined to minimize seepage.

9. Long-term operation and maintenance of the facility will include the removal of contaminated groundwater, and annual inspection of surface barriers. A minimum of 15 groundwater extraction wells will be installed to remove groundwater and reduce the hydraulic head within the confined area. Contaminated groundwater will be conveyed to a treatment system constructed on-site prior to discharge to a sanitary or storm sewer. Discharge to the sanitary sewer system will require approval from the City wastewater treatment plant, and discharge to a storm sewer will require a WPDES permit.
10. The treatment system will include an oil water separator, transfer pumps, and air stripper. This remediation equipment will be housed in a small on-site treatment building.

In-Situ Chemical Oxidation

In addition to the remedial components described above, in-situ chemical oxidation (GW-6) can be used to possibly enhance groundwater treatment. This will be determined during the pre-design phase. Chemical oxidation introduces strong oxidizing chemicals such as permanganate and peroxide into the subsurface to degrade VOCs and PAH compounds to CO_2 and H_2O end products. Permanganate or peroxide could be injected as liquid reagents through boreholes, wells, or mixed with a backhoe in shallow trenches. Chemical oxidation has an added benefit of enhancing biodegradation by increasing oxygen concentrations in the subsurface. Chemical oxidation could be performed on saturated and unsaturated zone soils by injecting chemicals into the subsurface via borings or wells.

In-situ chemical oxidation could be used for unsaturated and saturated zone contamination at the Upper Bluff. However, existing conditions at the Upper Bluff area (the NSPW facility building and buried gas holders) and at Kreher Park (wood waste layer) may limit implementability. Mixing reagent in shallow trenches would be the most effective treatment method at Kreher Park because contamination is present at shallow depths at the former coal tar dump area, and would be easily accessible. Because in-situ chemical oxidation reactions can result in the generation of off-gases, primarily CO_2, passive venting or an active SVE system may be required to capture off-gases. The presence of NAPL may require multiple applications to lower contaminant concentrations to acceptable levels. Key elements for the conceptual design for in-situ chemical oxidation for shallow soil and groundwater at the Site follow:

1. Demolition of the center section of the NSPW service center south of St. Claire Street would be required to access contaminated soil beneath the building at the Upper Bluff area.
2. Between 200 and 300 injection borings would be advanced in the Filled Ravine using a direct push drill rig.
3. It is assumed that approximately 1,500 gallons of reagent would be injected into each boring.
4. Injections would be completed in a controlled manner and monitored to ensure that reaction off-gases do not create unsafe conditions (i.e. explosive conditions). A minimum of 10 passive vent wells would be installed in the Filled Ravine to allow off-gases to escape, which would minimize the subsurface migration of gases. Each vent

well would be installed to an approximate depth of 20 feet with well screens 10 feet in length. Because the water table would intersect the well screen, these wells may also be used to recover fluids that rise to the surface in response to chemical reactions taking place in the subsurface. Recovered fluids would be placed in a holding tank and discharged to the on-site treatment system.

5. Site restoration at the Upper Bluff area would include replacement of existing asphalt pavement and new pavement over the footprint of the demolished building south of St. Claire Street. New pavement on the north of St. Claire Street would also be installed to prevent infiltration into this section of the Filled Ravine.
6. At Kreher Park, site preparation would include clearing and grubbing small trees and bushes along the bluff and near the former seep area as needed.
7. Chemical oxidation at Kreher Park would be completed above and in the wood waste layer where DNAPL is encountered and at the former coal tar dump area by mixing reagent in a shallow excavation.
8. Additionally, between 100 and 150 injection borings would be advanced at the former seep area and near TW-11 where DNAPL has been encountered. A direct push drill rig would be used to advance these borings, and approximately 1,500 gallons of reagent would be injected into each boring. Existing wells MW-7 and TW-11 would be used as passive vent wells in these areas.
9. Site restoration would include installation of new asphalt pavement over the marina parking lot and a low permeability soil cap over the former coal tar dump area to minimize potential exposure to subsurface contamination and minimize infiltration.
10. Regrading and a storm water basin would be constructed within the confined area to manage storm-water and restrict infiltration.
11. Multiple applications may be needed to reduce contaminant levels to the extent practicable. Two applications were assumed for cost-estimating purposes. The first application would be completed in a regular grid pattern over the treatment area, but additional applications would be completed within the treatment area as needed.

Although chemical oxidation applications can be completed within a short period of time, the groundwater extraction system may be operated for several years. Long-term groundwater monitoring to evaluate natural attenuation and institutional controls would be included with this remedial response.

Copper Falls Aquifer: Alternative GW-9B – NAPL Removal using Enhanced Groundwater Extraction System. Groundwater extraction uses water as a carrier to remove both NAPL and dissolved phase contamination. The existing interim groundwater extraction system currently extracts groundwater from one well installed at the mouth of the Filled Ravine, and groundwater and DNAPL from three low-flow wells installed in the underlying Copper Falls aquifer. Enhanced removal at the Upper Bluff area will include installation of additional low-flow extraction wells in the Copper Falls aquifer to increase DNAPL removal rates, and continued operation of existing wells EW-1, EW-2, and EW-3. This will also include continued operation of EW-4. Key elements for enhanced groundwater and NAPL extraction in the Upper Bluff area follow.

1. A minimum of 12 extraction wells will be installed in the Copper Falls aquifer.
2. Installation of lateral piping between each extraction well and the existing treatment building.
3. Replacement of existing asphalt pavement south of St. Claire Street and new pavement north of St. Claire Street will be installed to reduce infiltration into the ravine fill.
4. Recovered fluids will be treated on site prior to discharge to the sanitary or storm sewer. NAPL that is separated from the recovered fluids will be sent off-site for treatment and disposal. Discharge to the sanitary sewer system will require approval from the City wastewater treatment plant, and discharge to a storm sewer will require a WPDES permit. This will require upgrades to the existing treatment system (i.e. new oil water separator, and air stripper for increased volume).

The groundwater extraction system at the Upper Bluff area may be operated for an extended period of time. Long-term groundwater monitoring will be required to evaluate natural attenuation and institutional controls will also be implemented as part of this option. Based on the historical operation of the existing system, a combined groundwater extraction rate of two to three gallons per minute (gpm) was used to evaluate long-term operation and maintenance costs. Additional wells will result in an increase of the combined flow rate to 10 to 15 gpm, which will require an upgrade to the existing treatment system.

In addition, implementation of in-situ chemical oxidation (GW-6) for the underlying Copper Falls would be more extensive; it may require groundwater extraction rather than soil vapor extraction. EPA's SITE program completed a demonstration pilot test to fully evaluate the implementability of this alternative at the Site. This will be determined during the pre-design phase. Chemical oxidation may also increase the mobility of NAPL recovered by extraction wells resulting in the removal of significant contaminant mass in a short time frame. Preliminary results from the SITE program pilot test indicate that injection into areas with NAPL contaminants resulted in an initial vigorous reaction followed by an increase in the mobility and recovery of NAPL. Key elements for the conceptual design for in-situ chemical oxidation for the Copper Falls aquifer follow:

1. Between 250 and 500 injection borings would be advanced in the Copper Falls aquifer using a direct push drill rig.
2. It is assumed that approximately 1,500 gallons of reagent would be injected into each boring.
3. Existing extraction wells EW-1, EW-2, and EW-3 would continue to operate during and after reagent injection.
4. A minimum of 7 additional extraction wells would be installed in the Copper Falls aquifer in borings advanced with hollow stem auger using a rotary drill rig.
5. Recovered fluids would be treated on site prior to discharge to the sanitary or storm sewer. This would require upgrades to the existing treatment system. Discharge to the

sanitary sewer system would require approval from the City wastewater treatment plant, and discharge to a storm sewer would require a WPDES permit.

6. Multiple applications may be needed to reduce contaminant levels to the extent practicable. Two applications were assumed for cost-estimating purposes. The first application would be completed in a regular grid pattern over the treatment area, but additional applications would be completed within the treatment area as needed.

Although chemical oxidation applications can be completed within a short period of time, the groundwater extraction system may be operated for several years. Long-term groundwater monitoring to evaluate natural attenuation and institutional controls would be included with this remedial response.

Ozone Sparging

Ozone sparging is an in-situ chemical oxidation technology that can be used to oxidize and degrade contaminants in groundwater. Because ozone is a gas, it can be injected into the saturated zone as a gas via sparging. Sparging consists of injecting air or oxygen rich ozone into an aquifer as a gas through small diameter sparge wells. Commercially, ozone is generated by a high voltage discharge through air or oxygen in an ozone generator. Generally, yields are on the order of 1 to 3-percent ozone by volume in air and 2 to 6-percent ozone by volume in oxygen. In water, ozone decomposes to form free radicals. These free radicals are strong oxidizers and react with contaminants in water to form carbon dioxide and water. As an additional benefit, ozone treatment increases the dissolved oxygen level in the water when any un-reacted free radicals combine to form water and oxygen; the dissolved oxygen content in groundwater promotes biodegradation of contaminants.

Ozone sparging is typically used for dissolved phase contamination, but is typically not used in areas where NAPL is present. If used for NAPL contamination, groundwater extraction will likely be needed because ozone/air injection may displace NAPL and/or cause a chemical reaction increasing the mobility of NAPL. This mobilized material is then recovered via extraction wells. It will be determined during pre-design whether ozone sparging will be used for the Copper Falls aquifer. Key elements for the conceptual design of an ozone sparging system follow:

1. All sparge wells would be installed in soil borings advanced with a hollow stem auger by a rotary drill rig.
2. Sparge wells would be installed on approximate 50-foot diameter centers, and one control panel will inject ozone into a cluster of 12 sparge wells.
3. Six control panels would be needed for groundwater in the underlying Copper Falls aquifer.
4. All air lines between the sparge wells and control panels would be buried in shallow trenches.
5. For the Copper Falls aquifer, the groundwater extraction system would be operated concurrent with the ozone sparge system to recover NAPL.

The ozone sparge system may need to be operated for several years. Long-term groundwater monitoring would be required to evaluate the effectiveness of the sparging and subsequent natural attenuation, and institutional controls would be included with this remedial response.

Conduct O&M and Long-Term Monitoring: Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure the integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments. The long-term monitoring will evaluate achievement of the specified action levels and will ascertain whether the remedial actions objectives were achieved. The sampling endpoints, monitoring frequency and criteria will be part of the approved O&M plan.

Institutional Controls: Implement land use controls as provided under chapter 292 of the Wisconsin Statutes, as part of the remedial action to prohibit use of contaminated groundwater and restrict use of land at the Filled Ravine, Upper Bluff and Kreher Park to prevent exposure to contaminants that remain in groundwater and soil after implementation of the remedial action. Institutional controls to prohibit use of groundwater will be required until groundwater cleanup goals are achieved.

Institutional Controls (ICs) are necessary to prevent interference with the remedy and to reduce human or ecological receptors' exposure to contaminants. ICs are defined as non-engineered instruments, such as administrative and legal controls, that help minimize potential for exposure to contamination and protect the integrity of the remedy. ICs are also required to assure long-term protectiveness for those areas that do not allow for unlimited use and unrestricted exposure. ICs are also required to maintain the integrity of the remedy. At this Site, ICs are required to protect the cap (engineered remedy), and reduce potential exposure for all areas where residual contamination will remain. Also, interim ICs may be necessary to prevent exposure to contaminants which may be released during construction activities such as dredging, capping and placing of covers. Long-term protectiveness requires compliance with effective ICs. Hence, effective ICs must be implemented, monitored and maintained.

Institutional controls will be identified as part of the remedial design process in an Institutional Control Implementation and Assurance Plan (ICIAP) for review and approval by EPA and WDNR. The required ICs may include property use controls (such as easements and restrictive covenants), governmental controls (including zoning ordinances and local permits), and informational devices (including signage and fish consumption advisories). The ICIAP shall identify parties responsible (i.e., federal, State or local authorities or private entities) for implementation, enforcement, and monitoring and long-term assurance of each institutional control including costs, both short-term and long-term, and methods to fund the costs and responsibilities for each step.

The ICIAP shall include maps, which shall describe coordinates of the restricted areas on paper and provide shape files in an acceptable GIS format (i.e., NAD 83) depicting all areas that do not allow unlimited use/unrestricted exposure, where dredging is not allowed, and areas where ICs have been implemented along with a schedule for updating them. The maps and information about the ICs shall be made available to the public in at least several ways, such as a website that is easily accessible to the public and posted in the public library. In addition the ICIAP shall identify reporting requirements associated with each institutional control which shall include at a minimum an annual certification to EPA regarding the status and effectiveness of the ICs. The ICIAP shall also provide additional information to the public to assure protectiveness of the remedy (such as fish consumption advisories).

3. Compliance with the Institutional Control Implementation and Assurance Plan (ICIAP)

In accordance with the plans and schedules set forth in the approved RD Work Plan, Settling Defendants shall submit to EPA for review and approval an Institutional Control Implementation and Assurance Plan (ICIAP) that will require the implementation and maintenance of institutional controls to impose land and groundwater activity and use limitations over areas that do not support unlimited use/unrestricted exposure as set forth in the ROD. The final ICIAP shall be submitted to EPA prior to the pre-final construction inspection. The ICIAP shall include the following minimum requirements:

A. Areas That Cannot Safely Support Unlimited Use or Unrestricted Exposure ("Non-UU/UE Areas") – Activity and Use Limitations:

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i. Containment Systems: Settling Defendants shall implement and maintain Proprietary Controls to prohibit interference with the containment systems set forth in Section 2 of this SOW. Settling Defendants shall survey the area covered by the final containment systems and shall install "capped iron (set)" permanent markers placed at the boundaries of the containment systems. Settling Defendants shall implement Proprietary Controls that are enforceable in the State of Wisconsin.

ii. Limited Commercial or Industrial Use: Settling Defendant shall implement and maintain Proprietary Controls to prohibit all uses at the Site except those compatible with commercial or industrial land use. Examples of land uses that are prohibited on either a temporary or permanent basis include: residential uses, occupancy on a 24-hour basis; and uses to house, educate or provide care for children, the elderly, infirm or other sensitive subpopulations. Settling Defendants shall implement Proprietary Controls that are enforceable in the State of Wisconsin.

iii. Limited Groundwater Use: Settling Defendants shall implement and maintain Proprietary Controls to prohibit construction of wells and to prohibit any activity that extracts, consumes, or otherwise uses any groundwater at the Site, except for the purposes of an EPA approved response activity.

iv. Monitoring Systems: Settling Defendants shall implement and maintain

Institutional Controls to prohibit interference with the Monitoring Systems set forth in Section 3 of this SOW.

B. Demonstration that Institutional Controls cover all "non-UU/UE Areas: The ICIAP shall demonstrate that Institutional Controls cover all physical areas non- UU/UE areas based on current conditions for the entire Site. The ICIAP shall include a methodology for mapping of all non-UU/UE areas during and after completion of construction, including preparing final survey maps and legal descriptions of non-UU/UE areas.

C. Proprietary Controls: For Proprietary Controls, the ICIAP shall include:

i) a current title insurance commitment in the form of ALTA Commitment form - 1982 (as amended) from a title company, which shows title to the non-UU/UE areas to be free and clear of all prior liens and encumbrances. If Settling Defendants request that EPA waive this requirement after employing best efforts pursuant to Paragraphs 26 or 27 of the Consent Decree, Settling Defendants must demonstrate and certify that such preexisting liens, encumbrances or other property interests will not interfere with the remedy or cause undue exposure. Such a demonstration must include: a) copies of encumbrances referenced in the Title Commitment; b) identification of encumbrances that impact the non-UU/UE areas; c) copies of requests for subrogation agreements for such encumbrances; d) identification of the encumbrances on maps that depict parcel numbers and the area impacted by the encumbrance; and e) discussion of how use of existing encumbrances will impact the Site;

ii) arrangements for the execution and recording of such executed proprietary controls with the Warren County Recorder in accordance with the Consent Decree.

D. Long Term Stewardship: The ICIAP shall provide for long term maintenance and stewardship of the Institutional Controls. Settling Defendants shall maintain and ensure compliance with all Institutional Controls at the Site.

i. Inspections and Certification: The ICIAP shall require that Settling Defendants inspect the Site at least annually to evaluate compliance with the activity and use limitations set forth above in section II.5.A. In the annual report, Settling Defendants shall certify compliance with the activity and use restrictions set forth in section II.5.A;

ii. Groundwater IC requirements: The ICIAP shall require annual submittal to EPA of the following information regarding compliance with groundwater use limitations:

-a map showing the boundaries of the restricted groundwater area in the city ordinance and proprietary controls;

-a map showing the location of existing and any new wells located in and around the Site;

-discussion of whether the boundaries of restricted areas under the ICs are sufficient to prevent exposure to contaminated groundwater; and
-contingency plans if the ICs are not sufficient to prevent exposure to contaminated groundwater.

iii. Soil Management Plan Requirements: The ICIAP shall include a Soils Management Plan (SMP). The Settling Defendants shall develop the SMP and submit it to the EPA for review. Once the EPA approves the SMP, the Settling Defendants shall implement the plan in accordance with the approved RD Work Plan schedule. The SMP shall identify the process for ensuring that future land use at the Site, including utility installation and repair and foundation installation, is protective of human health and the environment. The SMP shall establish standardized procedures for any future construction at the site. The SMP shall identify the volumes and locations of soil that require management and establish management procedures for handling (excavating, grading, etc) and disposing of impacted soil. The SMP would also control exposure to construction workers during future work that may involve handling impacted soil by establishing engineering controls and other health and safety procedures.

III. SCOPE OF REMEDIAL DESIGN AND REMEDIAL ACTION

The Remedial Design/Remedial Action shall consist of six tasks. All plans are subject to EPA review and approval.

Task 1: RD Work Plan

Task 2: Remedial Design Phases

A. Preliminary Design
B. Prefinal Design/ Final Design

Task 3: Remedial Action Work Plan

Task 4: Remedial Action/Construction

A. Preconstruction Meeting
B. Prefinal Inspection
C. Final Inspection
D. Reports

1. Final Construction Report
2. Completion of Remedial Action Report

Task 5: Operation and Maintenance

Task 6: Performance Monitoring

Task 1: Remedial Design Work Plan

The Settling Defendants shall submit a Work Plan that shall document the overall management strategy for performing the design, construction, operation, maintenance and monitoring of Remedial Actions for EPA review and approval. The plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation and shall include a description of qualifications of key personnel directing the Remedial Design, including contractor personnel. The Work Plan shall also contain a schedule of Remedial Design activities. The Settling Defendants shall submit a Remedial Design Work Plan in accordance with Section ___, Paragraph___ of the Consent Decree and Section V of this SOW.

If the remedial design will require pre-design studies to provide information necessary to fully implement the remedial design and remedial action. This RD Work Plan shall include, at a minimum, an RD QAPP with appropriate detail for pre-design investigation, Health and Safety Plan, Field Sampling Plan and schedule. The pre-design studies may include further delineation of the extent of contamination in soils.

The Settling Defendants shall implement the pre-design work in accordance with the final RD Work Plan. The results of the pre-design studies shall be included with the 30% design submittal to the EPA.

Task 2: Remedial Design Phases

Settling Defendants shall prepare construction plans and specifications to implement the Remedial Actions at the Site as described in the ROD and this SOW. Plans and specifications shall be submitted in accordance with the schedule set forth in Section V below. Subject to approval by EPA, Settling Defendants may submit more than one set of design submittals reflecting different components of the Remedial Action. All plans and specifications shall be developed in accordance with EPA's Superfund Remedial Design and Remedial Action Guidance (OSWER Directive No. 9355.0-4A) and shall demonstrate that the Remedial Action shall meet all objectives of the ROD, the CD and this SOW, including all Performance Standards. Settling Defendants shall meet regularly with EPA to discuss design issues.

A. Preliminary Design

Settling Defendants shall submit the Preliminary Design when the design effort is approximately 30 % complete. The Preliminary Design submittal shall include or discuss, at a minimum, the following:

- Preliminary plans, drawings, and sketches, including design calculations;

- Results of treatability studies and additional field sampling;

- Design assumptions and parameters, including design restrictions, and performance criteria

- List of groundwater and soil analysis for performance monitoring

- Proposed cleanup verification methods, including compliance with Applicable or Relevant and Appropriate Requirements (ARARs);

- Outline of required specifications;

- Proposed siting/locations of processes/construction activity;

- Expected long-term monitoring and operation requirements;

- Real estate, easement, and permit requirements;

- Preliminary construction schedule, including contracting strategy.

B. Prefinal and Final Designs

Settling Defendants shall submit the Prefinal Design when the design effort is 95% complete and shall submit the Final Design when the design effort is 100% complete. The Prefinal Design shall fully address all comments made to the preceding design submittal. The Final Design shall fully address all comments made to the Prefinal Design and shall include reproducible drawings and specifications suitable for bid advertisement. The Prefinal Design shall serve as the Final Design if EPA has no further comments and issues the notice to proceed.

The Prefinal submittal shall include those elements listed for the Preliminary Design as well as, the following:

- Draft Performance Standard Verification Plan;

- Draft Construction Quality Assurance Plan;

The Final Design submittal shall include those elements listed for the Preliminary Design, as well as, the following:

- Final Performance Standard Verification Plan;
- Final Construction Quality Assurance Plan;
- Final QAPP/Final H & S Plan/Final FSP/Final Contingency Plan;
- Draft Operation and Maintenance Plan;
- Draft Institutional Control Implementation and Compliance Plan (see Section 3)
- Draft Soil Management Plan
- Capital and Operation and Maintenance Cost Estimate. This cost estimate shall refine the FS cost estimate to reflect the detail presented in the Final Design;
- Final Project Schedule for the construction and implementation of the Remedial Action which identifies timing for initiation and completion of all critical path tasks. The final project schedule submitted as part of the Final Design shall include specific dates for completion of the project and major milestones.

Task 3: Remedial Action Work Plan

The Settling Defendants shall submit a Remedial Action Work Plan which includes a detailed description of the remediation and construction activities. The RA Work Plan shall include a project schedule for each major activity and submission of deliverables generated during the Remedial Action. The Settling Defendants shall submit a Remedial Action Work Plan in accordance with Section __, Paragraph __ of the Consent Decree and Section V of this SOW.

Task 4: Remedial Action Construction

The Settling Defendants shall implement the Remedial Action as detailed in the approved Final Design. The following activities shall be completed in constructing the Remedial Action.

A. Preconstruction inspection and meeting:

The Settling Defendants shall participate with the EPA and the State in a preconstruction inspection and meeting to:

1. Review methods for documenting and reporting inspection data;

2. Review methods for distributing and storing documents and reports;

3. Review work area security and safety protocol;

4. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and,

5. Conduct a Site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The preconstruction inspection and meeting shall be documented by a designated person and minutes shall be transmitted to all parties.

B. Prefinal inspection:

Within 15 days after Settling Defendants make preliminary determination that construction is complete, the Settling Defendants shall notify the EPA and the State for the purposes of conducting a prefinal inspection. The prefinal inspection shall consist of a walk-through inspection of the entire Facility with EPA. The inspection is to determine whether the project is complete and consistent with the contract documents and the Remedial Action. Any outstanding construction items discovered during the inspection shall be identified and noted. Additionally, treatment equipment shall be operationally tested by the Settling Defendants. The Settling Defendants shall certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting shall be completed where deficiencies are revealed. The prefinal inspection report shall outline the outstanding construction items, actions required to resolve items, completion date for these items, and a proposed date for final inspection.

C. Final inspection:

Within 15 days after completion of any work identified in the prefinal inspection report, the Settling Defendants shall notify the EPA and the State for the purposes of conducting a final inspection. The final inspection shall consist of a walk-through inspection of the Facility by EPA and the Settling Defendants. The prefinal inspection report shall be used as a checklist with the final inspection focusing on the outstanding construction items identified in the prefinal inspection. Confirmation shall be made that outstanding items have been resolved.

D. Reports

1. Final Construction Report

Within 30 days of a successful final inspection, Settling Defendants shall submit a Construction Completion Report. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator shall state that the Remedial Action has been constructed in accordance with the design and specifications. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

2. Completion of Remedial Action Report

Within 60 days of a successful final inspection, Settling Defendants shall submit a Completion of Remedial Action Report. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator shall state the Remedial Action has been completed in full satisfaction of the requirements of this Consent Decree and that all performance standards have been achieved. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall demonstrate that all elements of the performance standard verification plan have been met, and that all performance standards have been achieved. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Task 5: Operation and Maintenance

The Settling Defendants shall prepare an Operation and Maintenance (O&M) Plan to cover both implementation and long term maintenance of the Remedial Actions. An initial Draft O&M Plan shall be submitted as a final Design Document submission. The final O&M Plan shall be submitted to EPA prior to the pre-final construction inspection, in accordance with the approved construction schedule. The plan shall be composed of the following elements:

1. Description of normal operation and maintenance;

    a. Description of tasks for operation;
    b. Description of tasks for maintenance;
    c. Description of prescribed treatment or operation conditions; and
    d. Schedule showing frequency of each O&M task.

2. Description of potential operating problems;

a. Description and analysis of potential maintenance problems;
b. Sources of information regarding problems; and
c. Common and/or anticipated remedies.

3. Description of routine monitoring and laboratory testing;

   a. Description of monitoring tasks;
   b. Description of required data collection, laboratory tests and their interpretation;
   c. Required quality assurance, and quality control ;
   d. Schedule of monitoring frequency and procedures for a petition to EPA to reduce the frequency of or discontinue monitoring; and
   e. Description of verification sampling procedures if Cleanup or Performance Standards are exceeded in routine monitoring.

4. Description of alternate O&M;

   a. Should systems fail, alternate procedures to prevent release or threatened releases of hazardous substances, pollutants or contaminants which may endanger public health and the environment or exceed performance standards; and
   b. Analysis of vulnerability and additional resource requirement should a failure occur.

5. Corrective Action;

   a. Description of corrective action to be implemented in the event that cleanup or performance standards are exceeded; and
   b. Schedule for implementing these corrective actions.

6. Safety plan;

   a. Description of precautions, of necessary equipment, etc., for Site personnel; and
   b. Safety tasks required in event of systems failure.

7. Description of equipment;

   a. Equipment identification;
   b. Installation of monitoring components;
   c. Maintenance of Site equipment; and
   d. Replacement schedule for equipment and installed components.

8. Records and reporting mechanisms required; and
   a. Laboratory records;
   b. Records for operating costs;
   c. Mechanism for reporting emergencies;
   d. Personnel and maintenance records; and
   e. Annual reports to State agencies.

9. Institutional Control Implementation and Assurance Plan – Long Term Stewardship (see Section 4)

Task 6: Performance Monitoring

Performance monitoring shall be conducted to ensure that all Performance Standards are met.

A. Performance Standard Verification Plan

The purpose of the Performance Standard Verification Plan is to provide a mechanism to ensure that both short-term and long-term Performance Standards for the Remedial Action are met. The Draft Performance Standards Verification Plan shall be submitted with the Intermediate Design. Once approved, the Performance Standards Verification Plan shall be implemented on the approved schedule. The Performance Standards Verification Plan shall include:

1. Quality Assurance Project Plan
2. Health and Safety Plan
3. Field Sampling Plan

The RI/FS approved QAPP may be modified to address the RD/RA activities. A new Health and Safety Plan will be required to address the RD/RA activities.

IV. CONTENT OF SUPPORTING PLANS

The documents listed in this section -- the Quality Assurance Project Plan, the Field Sampling Plan, the Health and Safety Plan, the Contingency Plan and the Construction Quality Assurance Plan -- are documents which must be prepared and submitted as outlined in Section III of this SOW. The following section describes the required contents of each of these supporting plans.

A. Quality Assurance Project Plan

The Settling Defendants shall develop a Site specific Quality Assurance Project Plan

(QAPP), covering sample analysis and data handling for samples collected in all phases of future Site work, based upon the Consent Decree and guidance provided by EPA (http://www.epa.gov/quality/qs-docs/g5-final.pdf). The QAPP shall be consistent with the requirements of the EPA Contract Lab Program (CLP) for laboratories proposed outside the CLP. The QAPP shall at a minimum include:

Project Description
- * Facility Location History
- * Past Data Collection Activity
- * Project Scope
- * Sample Network Design
- * Parameters to be Tested and Frequency
- * Project Schedule

Project Organization and Responsibility

Quality Assurance Objective for Measurement Data
- * Level of Quality Control Effort
- * Accuracy, Precision and Sensitivity of Analysis
- * Completeness, Representativeness and Comparability

Sampling Procedures

Sample Custody
- * Field Specific Custody Procedures
- * Laboratory Chain of Custody Procedures

Calibration Procedures and Frequency
- * Field Instruments/Equipment
- * Laboratory Instruments

Analytical Procedures
- * Non-Contract Laboratory Program Analytical Methods
- * Field Screening and Analytical Protocol
- * Laboratory Procedures

Internal Quality Control Checks
- * Field Measurements
- * Laboratory Analysis

Data Reduction, Validation, and Reporting
- * Data Reduction
- * Data Validation

* Data Reporting

Performance and System Audits
* Internal Audits of Field Activity
* Internal Laboratory Audit
* External Field Audit
* External Laboratory Audit

Preventive Maintenance
* Routine Preventative Maintenance Procedures and Schedules
* Field Instruments/Equipment
* Laboratory Instruments

Specific Routine Procedures to Assess Data Precision, Accuracy, and Completeness
* Field Measurement Data
* Laboratory Data

Corrective Action
* Sample Collection/Field Measurement
* Laboratory Analysis

Quality Assurance Reports to Management

The Settling Defendants shall attend a pre-QAPP meeting with EPA. The Settling Defendants shall submit a draft QAPP to EPA for review and approval.

B. Health and Safety Plan

The Settling Defendants shall develop a health and safety plan which is designed to protect on-site personnel and area residents from physical, chemical and all other hazards posed by this remedial action. The safety plan shall develop the performance levels and criteria necessary to address the following areas.

Facility Description
Personnel
Levels of protection
Safe work practices and safe guards
Medical surveillance
Personal and environmental air monitoring
Personal protective equipment
Personal hygiene
Decontamination - personal and equipment

Site work zones
Contaminant control
Contingency and emergency planning
Logs, reports and record keeping

The Health and Safety plan shall follow EPA guidance and all OSHA requirements as outlined in 29 CFR 1910 and 1926.

Contingency Plan included as part of the Health and Safety Plan

Settling Defendants shall submit a Contingency Plan describing procedures to be used in the event of an accident or emergency at the site. The draft Contingency Plan shall be submitted with the prefinal design and the [draft] final Contingency Plan shall be submitted with the final design. [The final Contingency Plan shall be submitted prior to the start of construction, in accordance with the approved construction schedule.] The Contingency Plan shall include, at a minimum, the following:

1. Name of the person or entity responsible for responding in the event of an emergency incident.

2. Plan and date(s) for meeting(s) with the local community, including local, State and Federal agencies involved in the cleanup, as well as local emergency squads and hospitals.

3. First aid medical information.

4. Air Monitoring Plan (if applicable).

5. Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), as specified in 40 CFR Part 109 describing measures to prevent and contingency plans for potential spills and discharges from materials handling and transportation.

C. Field Sampling Plan

The Settling Defendants shall develop a field sampling plan (as described in “Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," October 1988). The Field Sampling Plan should supplement the QAPP and address all sample collection activities.

D. Construction Quality Assurance Plan

Settling Defendants shall submit a Construction Quality Assurance Plan (CQAP) which describes the Site specific components of the quality assurance program which shall ensure that the completed project meets or exceeds all design criteria, plans, and specifications. The draft CQAP shall be submitted with the prefinal design and the [draft] final CQAP shall be submitted with the final design. [The final CQAP shall be submitted prior to the start of construction in accordance with the approved construction schedule.] The CQAP shall contain, at a minimum, the following elements:

1. Responsibilities and authorities of all organizations and key personnel involved in the design and construction of the Remedial Action.

2. Qualifications of the Quality Assurance Official to demonstrate he possesses the training and experience necessary to fulfill his identified responsibilities.

3. Protocols for sampling and testing used to monitor construction.

4. Identification of proposed quality assurance sampling activities including the sample size, locations, frequency of testing, acceptance and rejection data sheets, problem identification and corrective measures reports, evaluation reports, acceptance reports, and final documentation. A description of the provisions for final storage of all records consistent with the requirements of the Consent Decree shall be included.

5. Reporting requirements for CQA activities shall be described in detail in the CQA plan. This shall include such items as daily summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, and final documentation. Provisions for the final storage of all records shall be presented in the CQA plan.

V. SUMMARY OF MAJOR DELIVERABLES/SCHEDULE

A summary of the project schedule and reporting requirements contained in this SOW is presented below:

Submission	**Due Date**
1.	RD Work Plan Forty Five (45) days after Notice of Authorization to proceed with Supervising Contractor pursuant to Paragraph 10 of the Consent Decree
2.	Preliminary Design (30%) Seventy-five (75) days after EPA's approval of Final RD Work Plan

3.		Prefinal Design (95%) Sixty (60) days after receipt of Preliminary Design (30%)
4.		Draft ICIAP Thirty (30) days after receipt of EPA's comments on the Prefinal Design
5.		Final Design (100%) Thirty (30) days after receipt of EPA's comments on the Prefinal Design
6.		Draft O & M Plan Thirty (30) days after receipt of EPA's comments on the Prefinal Design
7.		RA Work Plan Thirty (30) days after EPA's approval of Final Design.
8.		Award RA Contract(s) Sixty (60) days after receipt of EPA's Approval of the RD Work Plan
9.	Pre-Construction Inspection and Meeting	Fifteen (15) days after Award of RA Contract(s)
10.	Initiate Construction of RA	Fifteen (15) days after Pre-Construction Inspection and meeting
11.		Completion of Construction As approved by EPA in RA construction schedule
12.		Prefinal Inspection No later than fifteen (15) days after completion of construction
13.		Final O&M Plan No later than Prefinal Inspection

14. Final ICIAP Plan No later than Prefinal Inspection

15. Prefinal Inspection Report Fifteen (15) days after completion of prefinal inspection

16. Final Inspection Fifteen (15) days after completion of work identified in prefinal inspection report

14. Construction Completion Report Thirty (30) days after final inspection

15. Completion of Remedial Action Within Sixty (60) days of the pre-certification inspection pursuant to the CD